REPORT RESUMES

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BUSINESS, INDUSTRIAL ARTS, AND GENERAL CONSUMER MATHEMATICS GUIDE, TENTATIVE.

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UTAH STATE BOARD OF EDUCATION, SALT LAKE CITY

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THIS "CONSUMER MATHEMATICS GUIDE" IS DESIGNED TO GIVE CONCRETE HELP TO TEACHERS OF NON-ACADEMIC MATHEMATICS STUDENTS IN THE PRACTICAL AREAS OF BUSINESS AND INDUSTRIAL ARTS. THE COURSE, WHICH IS RECOMMENDED FOR JUNIOR AND SENIOR HIGH SCHOOL STUDENTS, PLACES EMPHASIS ON CONCRETE EXAMPLES, APPLICATIONS, AND VISUAL MATERIALS. SOME UNITS OF THIS GUIDE ARE INTENDED TO BE COMMON TO ALL THREE POSSIBLE COURSES AND TAUGHT BY MEANS OF APPLICATIONS SUITED TO THE SPECIFIC COURSE. OTHER UNITS ARE INTENDED TO BE TAUGHT SPECIFICALLY IN ONLY ONE OR TWO OF THE POSSIBLE COURSES. THIS DIVISION IS RESPECTIVELY REPRESENTED AS "COMMON LEARNINGS" AND "SPECIAL LEARNINGS." THIS DIVISION IS DESIGNED TO DEVELOP UNITY AMONG THE THREE COURSES AND TO MEET SPECIAL VOCATIONAL NEEDS IN BUSINESS, INDUSTRIAL ARTS, AND GENERAL AREAS AS EACH COURSE DEVELOPS. TOPICS TO BE STUDIED UNDER THE DESIGNATION "COMMON LEARNING" BY ALL THREE GROUPS ARE (1) FUNDAMENTAL OPERATIONS WITH RATIONAL NUMBERS, (2) NUMBER RELATIONSHIPS, (3) GRAPHS AND STATISTICS, (4) ALGEBRAIC IDEAS, AND (5) PER CENT. TOPICS TO BE STUDIED UNDER "SPECIAL LEARNING" INCLUDE ADDITIONAL STUDY OF THE FUNDAMENTAL OPERATIONS BY THE GENERAL GROUP, THE STUDY OF PER CENT BY THE BUSINESS GROUP, AND STUDY OF GEOMETRY BY THE INDUSTRIAL AND GENERAL GROUPS. IT IS INTENDED THAT TEACHERS, USING THIS GUIDE AS A RESOURCE, WILL BE BETTER ABLE TO DEVELOP LESSON PLANS, TEACHING TECHNIQUES, AND EVALUATIVE PROCEDURES FOR THIS COURSE IN APPLIED MATHEMATICS. (RP)

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JAN 23 1967

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(Tentative)

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FOREWORD

This Consumer Mathematics Guide is designed to give concrete help to teachers of non-academic mathematics students. It is a direct result of a summer curriculum development workshop held during the summer of 1965 and jointly sponsored by the Utah State Board of Education and the Salt Lake City School District.

It is anticipated that Consumer Mathematics will be offered as three distinct courses when appropriate, namely: Business, Industrial Arts, and General Consumer Mathematics. Students will complete only one of these courses. Certain units studied are common to all three courses while other units vary with the course. All topics considered in the three courses contain many practical applications since Consumer Mathematics is regarded as "applied mathematics."

The courses outlined in this Guide will be acceptable as vocationally related mathematics programs as designated under Utah House Bill 63 and the Federal Vocational Act of 1963 and will satisfy the one unit of mathematics credit required for Utah high school graduation.

This Consumer Mathematics Guide, in its present form, is considered to be tentative. It is being field tested in pilot programs during the 1965-66 school year. Some revision of the course is then anticipated before it achieves a more permanent status.

Lerue Winget

Lerue Winget
Deputy Superintendent for Instruction

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Finally, thanks is given to the Salt Lake City Public Library for the use of their offices and conference room facilities for a three-week period in June, 1965.

PREFACE

Consumer mathematics students comprise a heterogeneous group, ranging from those with below average ability to those who are above average, or are very able. Consumer mathematics students should understand that certain vocational and other mathematics needs will be met by the study of this course. It is definitely not a "catch all" course for aimless students. Although it is not designed as a college preparatory course, Consumer Mathematics would be helpful to college-bound students. The course is recommended particularly for senior year high school students. A limited number of junior year students can profit from the course. It is not, however, recommended for sophomores.

Consumer mathematics students have frequently experienced dissatisfaction, frustration, and even failure in previous mathematics courses; therefore, the consumer mathematics teacher should employ special imagination in order to motivate the students and to create an interesting course. Emphasis should be placed on concrete examples, applications, and visual materials. Abstractions and generalizations should be kept to a minumum since they may cause many difficulties for pupils.

Some units of this Guide are intended to be common to all three possible courses and taught by means of applications suited to the specific course. Other units are intended to be taught specifically to only one or two of the possible courses. The units common to all courses are referred to as "Common Learnings." The other portions of the Guide are designated "Special Learnings." This division is designed to develop unity among the three courses and to meet special vocational needs in business, industrial arts, and general areas as each course develops.

Topics to be studied under the designation "Common Learnings" by all three groups are:

1. Fundamental Operations With Rational Numbers
2. Number Relationships
3. Graphs and Statistics
4. Algebraic Ideas
5. Per Cent

Topics to be studied under "Special Learnings" include additional study of the Fundamental Operations by the General group; added study of Per Cent by the business group; and study of Geometry by the industrial and general groups.

A spiral development is indicated especially in such topics as Ratio and Proportion which is not new to students of Consumer Mathematics and which should be taught with this fact in mind.

Special attention should be given to the unit on Finances in order that students will be knowledgeable concerning their own personal finances and small business procedures.

Careful lesson planning should be an integral part of the unit preparation of the consumer mathematics teacher. One of the purposes of the Guide is to give some specific help to the teacher in the process of lesson planning. It is expected that the teacher will take over where the Guide stops in preparing stimulating activities for students.

Evaluation of student work is an important aspect in the growth of consumer mathematics students because many are unable to objectively evaluate themselves. The teacher should devise a variety of ways to evaluate, including some informal ways. Students will thereby come to understand that an examination is not the sole criterion for evaluation. Improved student attitudes as well as increased understanding should be considered part of the evaluation process.

In summary, this Guide is intended to provide assistance to consumer mathematics teachers in the practical areas of business and industrial arts. It is intended that the teacher, using the Guide as a resource, will develop lesson plans, teaching techniques, and evaluative procedures for this course in applied mathematics.

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Unit 3. Measurement
Unit 4. Introduction to Geometry

BUSINESS

UNIT I

FUNDAMENTAL OPERATIONS WITH RATIONAL NUMBERS

(4 weeks)

INTRODUCTION: Life in today's complex society necessitates the accurate use of basic arithmetic skills. There are various methods of preparing students to understand and apply simple mathematical principles. The degree to which the student applies mastered skills will help determine success in many fields.

CONCEPT: A mastery of basic arithmetic skills contributes to a logical understanding of mathematics.

CONTENT

I. Addition
    A. Whole Numbers
    B. Fractions
        1. Decimal Fractions
        2. Approximations ("Rounding Off")
        3. Common Fractions
            a. Proper
            b. Improper
            c. Conversion between decimals and fractions
            d. Mixed numbers

II. Subtraction (Inverse Operation of Addition)
    A. Whole Numbers
    B. Fractions
        1. Decimal Fractions
        2. Approximations("Rounding Off")
        3. Common Fractions
            a. Proper

REFERENCES AND RESOURCES

The following references are background for the entire unit:

Basic Mathematics Simplified, Section II, pp. 28-62 and Section III, pp. 63-88.

Applied Business Mathematics, Part 10b, pp. 66-115.

Business Mathematics, Chapter 1, pp. 11-13, and Chapter 2, pp. 23-26, and Chapter 3, pp. 42-43, and Chapter 4, pp. 55-57, and Chapter 5, pp. 65-93.

Fundamentals of Mathematics, Chapters 5 and 6, pp. 84-148.

General Mathematics, Book II, Chapter 1, pp. 30-38 and Chapter 4, pp. 138-200.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. Addition

B. Fractions

1. Decimal 2.6 + 3.25 + 20.2 + .625

In adding decimals stress the importance of writing the numerals in a vertical column, keeping the decimal points directly under each other (vertical alignment)

$$\begin{array}{r@{.}l} 2&6 \\ 3&25 \\ 20&2 \\ &625 \\ \hline \end{array}$$

2. Approximations ("Rounding Off")

Stress the fact that only the digit immediately to the right of the digit to be retained determines how the number is rounded.

In general business practice, if the digit to the right of the digit to be retained is five or greater, then the last retained digit is rounded up one. Otherwise, the retained digit remains unchanged. The remaining digits following the digit to be rounded are dropped.

$2.8749
$2.87
(nearest cent)

3.2456
3.246 (nearest thousandth)

3. Common Fractions (Form $\frac{a}{b}$ where a & b are whole numbers and $b \neq 0$)

In adding unlike fractions it is necessary to convert them to equivalent fractions with common denominators.

CONTENT REFERENCES AND RESOURCES

        b. Improper
        c. Conversion between decimals and fractions
        d. Mixed Numbers

III. Multiplication
  A. Whole Numbers
  B. Fractions
    1. Decimal Fractions
    2. Approximations ("Rounding Off")
    3. Common Fractions
      a. Proper
      b. Improper
      c. Conversion between decimals and fractions
      d. Mixed numbers

IV. Division (Inverse Operation of Multiplication)
  A. Whole Numbers
  B. Fractions
    1. Decimals Fractions
    2. Approximations
    3. Common Fraction
      a. Proper
      b. Improper
      c. Conversion between decimals and fractions
      d. Mixed decimals

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. 3. b. Improper Fractions
Examples: 4/3, 3/2, 11/7

I. 3. c. Conversion between decimals and fractions

1. Fraction to decimals: Divide the numerator by the denominator and compute to the desired approximation.

   1/8 is changed as:

$$\begin{array}{r} .125 \\ 8\overline{)1.000} \end{array}$$

2. Decimal to fraction: The numerals listed are to be placed in the numerator. The denominator becomes a numeral equivalent to the name of the placeholder of the decimal. Then, reduce to lowest terms.

$$.125 = \frac{125}{1000} = \frac{1}{8}$$

I. 3. d. Mixed Numbers (Whole numbers and a fraction)

III. Multiplication

B. Fractions

1. Decimal fractions (The number of decimal places in the product must equal the sum of the number of decimal places in both factors.)

$3 \times .23 = .69$

$.22 \times .7 = .154$

$2.3 \times .021 = .0483$

$2.01 \times 4.001 = 8.04201$

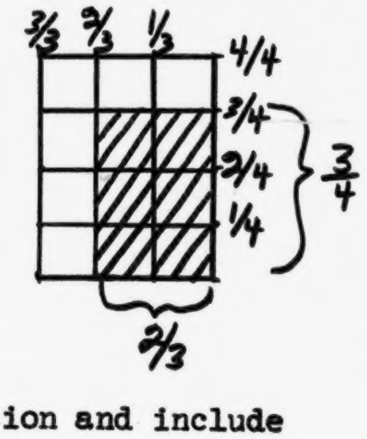
3. Common fractions (the product of two fractions is the product of the numerators divided by the product of the denominators.)

$5 \times 1/2 = 5/2$ or $2\ 1/2$

$3/4 \times 2/3 = 6/12$ or $1/2$ (see diagram)

$2\ 1/2 \times 2/3 = \frac{5}{2} \times \frac{2}{3} = \frac{10}{6}$ or $\frac{5}{3}$ or $1\ 2/3$

$2\ 1/2 \times 3\ 2/3 = \frac{5}{2} \times \frac{11}{3} = \frac{55}{6}$ or $9\ 1/6$



a. Give a concise definition of a proper fraction and include examples.

UNIT II

NUMBER RELATIONSHIPS

(3 weeks)

INTRODUCTION: The intelligent use and the understanding of mathematical principles (closure, associative, commutative, distributive) and the identity and inverse elements help to explain the operation of the rational number system.

CONCEPT: More efficient solving of mathematical problems can result from a better understanding of number properties and relationships.

CONTENT	REFERENCES AND RESOURCES
I. Principle of Closure	I. Basic Mathematical Concepts. pp. 49-50 and pp. 64-65. Pre-Algebra Mathematics, Chapter 4.
II. Associative Principle	
III. Commutative Principle	
IV. Distributive Principle	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

Help students gain an understanding of the following number properties:

I. A set is closed under a given operation if the result of operating on any members of the set also belongs to the set. (A set is a collection of well defined objects.)

If a and b are rational numbers, then $a+b$ and $a \cdot b$ are also rational numbers. Thus the set of rational numbers is closed under the operations of addition and multiplication.

$2+3=5$
$2 \cdot 3=6$

II. The way in which numbers are grouped for addition or multiplication does not alter the final result.

$a+(b+c)=(a+b)+c$
$a \cdot (b \cdot c)=(a \cdot b) \cdot c$

$(3+5)+6=3+(5+6)$
$(3 \cdot 5) \cdot 6=3 \cdot (5 \cdot 6)$

III. The order of adding or of multiplying does not affect the result.

If a and b are rational numbers, then $a+b=b+a$ and $a \cdot b=b \cdot a$.

$3+5=5+3$
$3 \cdot 5=5 \cdot 3$

IV. The distributive property of multiplication over addition (or subtraction) indicates that when one number is multiplied by the sum (or difference) of a second and a third number, the result is the same as when the product of the first and third numbers is added to (or subtracted from) the product of the first and second.

If a, b, and c are rational numbers, then $a \cdot (b+c)=(a \cdot b)+(a \cdot c)$

$2\ (5+3)=2 \cdot 5+2 \cdot 3$
$2\ (5-3)=2 \cdot 5-2 \cdot 3$
$98\ (5+95)=(98 \cdot 5)+(98 \cdot 95)$

CONTENT	REFERENCES AND RESOURCES
V. Identity Elements	
VI. Inverse Elements	
VII. Operations with Zero	
A. Multiplication by Zero	
B. Division by Zero	

V. Identity Elements

A. The identity element of the rational numbers under addition is the number zero. The sum of any rational number and zero is the original rational number.

There is a rational number, 0, such that $a+0=a$ for any rational number a.

$5+0=5$ (additive unchanger)

B. The identity element for the rational numbers under multiplication is the rational number one. The product of any rational number and one is the rational number.

There is a number, 1, such that $a \cdot 1=a$ for any rational number a.

$5 \cdot 1=5$ (multiplicative unchanger)

VI. Inverse Elements

A. For every rational number "a" there is an additive inverse -a such that:

$a+(-a)=0$

$3+(-3)=0$

B. For each non-zero rational number "b" there is a multiplicative inverse 1/b such that:

$b \cdot \frac{1}{b}=1$

$2 \cdot 1/2=1$

Some texts use the term reciprocal. When the product of two rational numbers equals 1, each is the reciprocal of the other.

$1/3 \times 3=1$, 1/3 is the reciprocal of 3 and 3 is the reciprocal of 1/3.

Each rational number except zero has an inverse.

VII. Operations with Zero

A. The product of zero and any rational number always produces zero.

$a \cdot 0=0$

$3 \cdot 0=0$

B. The operation of division by zero is undefined.

If $\frac{12}{6}=2$, then $12=2.6$ (true)

If $\frac{12}{0}=0$, then $12=0.0$ (false)

If $\frac{12}{0}=12$, then $12=12.0$ (false)

If division by zero were possible, then 12 divided by zero could equal any number.

UNIT III

GRAPHS AND STATISTICS

(3 weeks)

INTRODUCTION: Graphs are a visual means of showing specific data. It is possible to compare one set of data with another and determine from the graph the values for various conditions. Care must be taken in interpreting the graph in order to reach a valid conclusion.

CONCEPT: Graphs illustrate relationships and trends pictorially.

CONTENT	REFERENCES AND RESOURCES
I. "Comparison" Graphs	I. Business Mathematics, Chapter 13, p. 427. Mathematics, Chapter 4, p. 104.
A. Bar	
B. Broken Line	
C. Circular	
D. Rectangular	
E. Pictorial	
II. "Time-Change" Graph	
III. Coordinates-Plotting Points in a Plane (Optional)	
IV. Frequency Distributions (Scatter-Diagrams)	IV. Graphs and Statistics of Basic Mathematics, pp. 56-61. Film: "Language of Graphs", 1948, 31 min. color National Council of Teachers of Mathematics 1201 Sixteenth Street Washington D.C. 20036
V. Mean, Median, and Mode	

ACTIVITIES, EXAMPLES AND TEACHING SUGGESTIONS

II. "Time-Change" Graph

Example: Indicate how a single item such as stocks, prices, or the temperature, changes in a period of time. These graphs are often of great value in prediction.

IV. Frequency Distributions

A rectangular or circular graph upon which data are plotted will show trends, relationships, or the pattern of distribution. Scatter diagrams are used primarily to show the relationship between two sets of data. Scatter diagrams are also used to give an indication of the pattern formed by a set of objects over a given surface.

V. Mean, Median, and Mode

A. The mean or average is the sum of the addends divided by the number of addends.

B. The median is the middle value in a consecutively ordered series.

C. The mode denotes the most frequently occuring value in a collection of values. In the collection of values, 4, 5, 7, 5, 4, 5, 6, 8, 5, and 7, the mode is 5.

UNIT IV

ALGEBRAIC IDEAS

(5 weeks)

INTRODUCTION: The study of algebra can assist the student in understanding the relationship of the numbers of arithmetic and in solving more complex problems. It is necessary to make the student feel comfortable in the use of algebraic principles. Fear of the word "algebra" and algebraic principles has been built up over a period of time. In order to pursue further studies in mathematics, this fear must be overcome.

CONCEPT: An understanding of algebraic principles can aid in problem solving.

CONTENT	REFERENCES AND RESOURCES
I. Directed Numbers	I. Pre-Algebra Mathematics. Fundamentals of Mathematics, Chapter 11, pp. 205. Basic Mathematics Simplified, part 11, pp. 214-343.
II. Algebraic Numbers	II. Film: "Symbols in Algebra", 11 min. bw National Council of Teachers of Mathematics 1201 Sixteenth Street, N.W. Washington, D.C. 20036
III. Sentences and Formulas	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. Directed Numbers

Numbers have both value and direction.

Examples:

Debits and credits, net income, and net loss.

The number line is one way of explaining directed numbers.

$$\overline{-4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4}$$

III. Sentences and Formulas

Mathematical sentences that contain a variable or placeholder are called open sentences.

$N + 7 = 12$, $2 + \boxed{} = 7$

A formula is an algebraic way of stating a rule or relationship.

$I = P R T$

Show the connection between open sentences and formulas.

CONTENT	REFERENCES AND RESOURCES
IV. Functions (Optional)	IV. Film: "Concept of a Function." 16 min. National Council of Teachers of Mathematics 1201 Sixteenth Street, N. W. Washington, D.C. 20036
V. Ratio and Proportion	V. *Basic Mathematical Concepts*

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

IV. Functions (Optional)

If this topic is introduced, it might be appropriately developed in connection with graphing. Graphing makes possible the development of a quantitive approach to the function topic.

V. Ratio and Proportion

A ratio is an indicated division between two rational numbers.

Example: $\frac{a}{b}$ where b is not zero; such as -- $a \div b$, $3/4$

A proportion is an expression of equality between two ratios.

Example: $\frac{a}{b} = \frac{c}{d}$ where b and d are not zero.

$$\frac{6}{8} = \frac{3}{4}$$

This is sometimes shown as follows:

$$a : b :: c : d$$

In a proportion the product of the means must equal the product of the extremes. The first and fourth terms are called the extremes, and the second and third terms are called the means i. e. $\begin{matrix}(1)\\(2)\end{matrix}\frac{a}{b} = \frac{c}{d}\begin{matrix}(3)\\(4)\end{matrix}$

Four and six are the means, and three and eight are the extremes.

$$\frac{3}{4} = \frac{6}{8}$$

Other properties of proportions can be found in any good geometry book.

UNIT V

PER CENT

(5 weeks)

INTRODUCTION: Per cents are used as more convenient or meaningful substitutes for fractions and decimals in personal and business affairs. Student's marks on tests, salesman's commissions, interest rates, discounts, and statistical ratios are usually expressed in the form of per cents instead of fractions or decimals.

CONCEPT: A per cent is another way of expressing the ratio or fractional relationship between two numbers.

CONTENT	REFERENCES AND RESOURCES
I. Applications for Per Cent in Business.	Applied Business, Section 17, p. 124.
A. Commissions	Business Mathematics, Chapter 6, pp. 94-118.
B. Borrowing Money	
C. Installment Buying	Fundamentals of Mathematics, Chapter 7, p. 162.
D. Savings	Arithmetic for Business and Consumer Use, pp. 170-198.
E. Life Insurance	
F. Investments	
G. Taxes	Basic Mathematical Concepts, pp. 150-151.
H. Discounts	
I. Rate of Net Profit or Loss	
J. Rate of Markup	
II. Interest	
A. Simple	
B. Compound	Handbook of Business Mathematics, pp. 244-292.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. Solving per cent problems by the proportion method.

A. Finding a per cent of a number.

5% of 300 = ?

$$\frac{5}{100} = \frac{X}{300}$$

B. Finding what per cent one number is of another.

10 is what per cent of 20? $\frac{10}{20} = \frac{x}{100}$

C. Find the whole when a part is known.

5% of $\overset{?}{\_\_\_\_\_\_\_\_}$ is 30. $\frac{5}{100} = \frac{30}{X}$

PER CENT MEANS HUNDREDTHS

Another method of solving per cent problems is by use of the formula $P = B\,R$ where
P = percentage
R = rate
B = base

II. Interest

A. Simple interest is found by multiplying the principle by the rate by the time (years). Hint: Use 360 days as a year.

B. Compound interest is interest figured on both the principal and the interest it has earned. This interest is added to the principal at regular intervals. Most banks figure interest on an even dollar basis.

Algebraic formula for computing compound interest

$$I = P\,(1 + r)^N$$

I = Compound interest
P = Principal
$r = \frac{R}{n}$
R = Annual interest rate
n = Pay periods per year
N = Pay periods

CONTENT	REFERENCES AND RESOURCES
III. Commission	
A. Sales	
1. Straight	
2. Graduated	
B. Brokerage	B. The following sources can give give helpful information: Salt Lake Stock Exchange 39 Exchange Place Salt Lake City, Utah Goodbody & Company 134 South Main Street Salt Lake City, Utah
IV. Investments	IV. *Applied Business*, pp. 34 and 318-334.
A. Stocks	
B. Bonds	
C. Real Estate	
D. Savings.	
V. Taxes	V. *Arithmetic for Business and Consumer Use*, pp. 199-223.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

III. Commission

A. Sales

1. Straight sales commission is the product of the rate of commission and the total amount of sales.

2. Graduated - Same as straight sales except the rate changes as the sales increase.

   1% on the first $1000
   2% on the second $1000
   and so forth

B. Brokerage is commission computed at various rates for the sale of stocks, bonds, and commodities.

UNIT VI

MEASUREMENT

(2 weeks)

INTRODUCTION: Measurement, a process of comparison, is necessary in daily living, as well as in the advancement of science in the present age. Scientific ideas must be translated into measurement before they can be useful to man.

CONCEPT: The ability to compare and to communicate properly the comparative result, increases through understanding the principles of measurement.

CONTENT

I. Basic Measuring Skills

   A. Common English and Metric Units of Measure

      1. Length, Area, Volume

      2. Weight

      3. Time

   B. Common Instruments of Measure

      1. Rules and Tapes

      2. Protractors

      3. Containers for Liquid Measure

REFERENCES AND RESOURCES

Measurement - Basic Mathematics, pp. 66-175.

Essentials of Mathematics, part 1, Chapter 5, 6, part 11, Chapters 1-8, pp. 65-175.

Basic Mathematics Concept, Chapters 8, 9, pp. 190-273.

Basic Mathematics Simplified, Section 4, unit 18-24.

Applied Business Mathematics, Unit 18, pp. 477-500.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. A. Obtain and use metric conversion wall charts.

Name and discuss conversion facts such as:

$$\left.\begin{array}{l}1\text{ ft.} = 12\text{ in.}\\1\text{ meter} = 100\text{ centimeters}\end{array}\right\}\text{ within the system}$$

$$\left.\begin{array}{l}1\text{ in.} \approx 2.54\text{ cm.}\\1\text{ meter} \approx 39.37\text{ inches}\end{array}\right\}\text{ between systems}$$

I. B. Name and demonstrate the use of such instruments as rulers, weights, scales, meters (gas, electric, water), and micrometers.

CONTENT	REFERENCES AND RESOURCES
C. Common Instruments of Location 1. Compasses	
2. Scale Drawings	
D. Approximate Nature of Measurement	I. D. Basic Mathematical Concepts, Chapter 9, p. 254. Mathematics, A Liberal Arts Approach, Chapter 3, pp. 64-69.
1. Precision of Measuring	
2. "Rounding-off" Techniques	
II. Linear Measurement	
A. Distance Between Two Points	
B. Perimeter and Circumference	
III. Areas of Plane Figures	
A. Quadrilaterals	
B. Triangles	
C. Circles	
D. Other Figures	
IV. Volume	
A. Prism	
B. Cylinder	
C. Cone	
D. Pyramid	
E. Sphere	
V. Measuring Capacity	
A. Dry	
B. Liquid	
VI. Angular Measurement	
VII. Measuring Weight	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. C. 1. Have each student work with a compass.

2. Work with blue prints and maps.

II. Use various measuring instruments. Emphasize that the smaller the unit of measure the more accurate the measure.

III. Emphasize the application of algebraic formulas in computing areas. The area of a rectangle may be determined by:

$A = LW$ where $A =$ area, $L =$ length, and $w =$ width

III. B. Area (A) of a triangle may be determined by 1/2 the base (b) times height (h).

$A = 1/2\ bh$

IV. Emphasize algebraic formulas again, such as the formula for finding the volume of a cylinder.

$V = BH$, where $V =$ volume, $B =$ area of base, and $H =$ height

V. Teach the comparison of liquid and dry measure, i. e., dry quarts to bushels and liquid quarts to gallons. Clear up the difference between liquid and solid measurement.

VII. Teach the units of weight and measurement in both English and Metric systems. Also teach conversion between systems.

Example: Ounces to pounds Pounds to kilograms.

CONTENT

REFERENCES AND RESOURCES

VIII. Rates

- A. Relative to Time
- B. Relative to Measure

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

VIII. A. Teach the distance formula: Only one form need by learned because the other forms follow from it.

$$D = R\ T$$

$$R = \frac{D}{T}$$

$$T = \frac{D}{R}$$

D = distance
T = time
R = rate

VIII. B. Teach concepts of rates applying to rate of consumption, i. e. gallons per hour and miles per gallon.

UNIT VII

FINANCES

(14 weeks)

INTRODUCTION: Every citizen in carrying out his personal activites, makes business contacts. To accept responsibility, every student leaving high school should have an understanding of the financial structure of our society.

CONCEPT: A basic foundation in common business activities helps to develop appreciation and understanding of the operation of our economic system.

CONTENT	REFERENCES AND RESOURCES
	* Applied Business Mathematics * Business Mathematics * General Business * The above references generally apply to the entire unit.
I. Personal Finance	
A. Figuring Wage Income	
1. Fixed Wage	
2. Commission	
B. Deductions	
C. Personal Cash Records	
1. Budgets	
2. Checking Account	I. C. 2. Mathematics in Business, Chapter 1, pp. 1-39. Arithmetic for Business and Consumer Use, Units 67-70, pp. 264-277.
a. Checkbook	
b. Passbook	
c. Deposit slips	
d. Bank statement and reconciliation	
e. Stop-payment order	
f. Bank service charges	

ACTIVITIES, EXAMPLES AND TEACHING SUGGESTIONS

I. A. 1. Show that a fixed wage is a definite amount whether it is based on an hourly, daily, or monthly rate. Overtime or double time is paid on hourly or daily rates only.

I. A. 2. Illustrate that a commission is an incentive type earning.

I. B. Compute a pay check. Figure gross pay and use the various payroll deductions that apply to determine the take-home pay (net pay).

I. C. 2. Obtain examples of the various banking forms. Checking accounts are referred to as demand deposits.

CONTENT	REFERENCES AND RESOURCES
3. Methods of Payment	C. 3. General Business for Everyday Living, Part 10, pp. 80-87.
a. Cash	
b. Personal check	
c. Cashier's check	
d. Certified check	
e. Traveler's checks	
f. Money orders (1). Postal (2). Express (3). Telegraphic (4). Bank	
g. C. O. D.	3. g. General Office Practice, Chapter 20, 21, 22, pp. 264-306.
II. Consumer Buying	
A. Sales Slips	II. A. General Office Practice, Chapter 1, p. 10. General Business for Everyday Living, Part 16, p. 139.
B. Unit Costs 1. Single Unit 2. Volume Buying 3. Fractional Quantity 4. Alioquot Parts 5. Average Price	
III. Borrowing Money	III. College Business Mathematics, Unit 15, pp. 113-129.
A. Loans 1. Signature 2. Secured a. Chattel b. Real	III. A. Business Principles, Organization, and Management, Chapter 12, pp. 188-193 and Chapter 26, pp. 435-436.
B. Notes 1. Promissory 2. Demand	
C. Loaning Agencies 1. Banks 2. Savings and Loan Associations 3. Small Loan Companies 4. Credit Unions 5. Insurance Companies	III. C. General Business for Everyday Living, Part 18, pp. 158-162. Personal Business Law, Part 41, pp. 419-424. Applied Economics, Chapter 34, pp. 483-492.

I. C. 3. Point out instances where each of the negotiable instruments would be used. Cover the use of bank drafts.

II. Consider price, quality, and quantity when purchasing.

II. A. Have students fill out sales slips.

II. B. Give the students practice in figuring the various unit costs.

III. Stress the importance of establishing and maintaining a good credit rating. Paying cash does not give proof of a good credit rating.

III. A. Distinguish between signature and secured loans.

III. B. Discuss the following terms: face, maturity, rate, and discount.

III. C. Explain costs of installment loans vs. single payment loans. Suggest activity: Have students obtain loan requirements from various loaning agencies.

CONTENT	REFERENCES AND RESOURCES
D. Installment Buying 1. Down Payment 2. Carrying Charge a. Interest rate b. Bookkeeping expense	III. D. Mathematics in Business, Chapter 4, pp. 86-101. Business Principles, Organization and Management, Chapter 13, pp. 137-145.
IV. Investments	IV. College Business Math, Unit 18 pp. 137-145. General Business for Everyday Living, Unit 5, pp. 166-195. Business Principles, Organization, and Management, Chapter 15, pp. 236-250.
A. Savings Account	
B. Life Insurance 1. Straight 2. Limited Pay Life 3. Endowment 4. Group	IV. B. Suggested Pamphlets: *"Blueprint for Tomorrow, A Life and Health Insurance Workbook for Business Education." *"Policies for Protection, How Life Insurance and Health Insurance Work." * See bibliography
C. Bonds 1. Government 2. Municipal 3. Corporate D. Stocks 1. Preferred 2. Common	IV. C.& D. Suggested pamphlets which can be obtained from the New York Stock Exchange: "Types of Business Organizations" "The American Corporation" "Stocks: Common and Preferred" "Bonds: Government, Municipal and Corporate" "The New York Stock Exchange" "Buying and Selling Stocks" "Capitalists: Investors in the Nation's Business" "Investing for American Families" "The Newspaper and the Investor" "Sources of Information on Investments"

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

III. D. Explain the advantages and disadvantages of installment buying. Discuss the role of the complex credit system in the United States. In many business situations the entire transaction is merely the manipulation of figures.

IV. A. Have students contact various banking institutions to determine different rates of interest. As a rule, savings and loan associations pay a higher rate of interest.

IV. B. Emphasize cash surrender value, paid-up value, and loan features. Use resource people in community and insurance companies.

IV. C.& D. Distinguish between stocks and bonds. Use problems to show earning power of common vs. preferred stock. Understand the meaning of stock market quotations.

CONTENT	REFERENCES AND RESOURCES
E. Mutual Funds	
F. Real Estate	
V. Home Ownership A. Financing 1. Banks 2. Savings and Loan Associations 3. Insurance Companies B. Insurance 1. Fire Policy 2. Homeowners Policy a. Fire b. Theft c. Windstorm d. Personal Liability e. Glass breakage	V. A. & B. Arithmetic for Business and Consumer Use, Unit 7, pp. 281-285 and Unit 16, pp. 364-372. General Business for Everyday Living, Part #28, pp. 255-259. Mathematics in Business, Chapter 5, pp. 113-120.
C. Taxes	V. C. Mathematics in Business, Chapter 5, pp. 113-120. Arithmetic for Business and Consumer Use, Unit 54, pp. 216-220.
D. Maintenance	
E. Utilities	
F. Depreciation	
G. Home Ownership vs. Renting	
VI. Travel and Transportation A. Automobile Ownership 1. Financing	VI. A. 1. Mathematics in Business, Chapter 2, pp. 40-68 and Chapter 4, pp. 86-101.
2. Insurance	VI. A. 2. General Business for Everyday Living, Part 27, pp. 243-251. Arithmetic for Business and Consumer Use, Unit 99, pp. 372-377. Mathematics in Business, Chapter 6, pp. 125-131.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

V. Teach that three ways of home financing are: Conventional, FHA, and GI.

V. C. Obtain copies of tax notices and discuss methods of computations.

VI. A. 2. Discuss the Financial Responsibility Laws.

CONTENT	REFERENCES AND RESOURCES
3. Operating Expenses	
4. Depreciation	A. 4. Mathematics in Business, Chapter 12, pp. 307-333.
5. Ownership vs. Leasing	A. B. General Business for Everyday Living, Parts 33-35, pp. 300-328.
B. Public Transportation	
1. Cost Per Mile 2. Time Schedules 3. Travel Insurance 4. Services	
C. Shipping Goods	VI. C. General Business for Everyday Living, Parts 40-41, pp. 372-388.
1. Parcel Post 2. Express 3. Freight	Retail Merchandising, Chapter 5, Part D. pp. 150-154.
VII. Communications	VII. General Business for Everyday Living, Part 36, 37, 38, 39, pp. 334-367.
A. Postal	
B. Telegraph	VII. B. General Office Practice, Chapter 13, p. 170-182.
VIII. Taxes	VIII. A. Mathematics in Business, Chapter 14, pp. 357-376.
A. Income Taxes	
1. Federal 2. State	Business and Consumer Use, Unit 52 pp. 204-212.
	VIII. B. General Business for Everyday Living, Part 45, pp. 424-425.
B. Indirect Taxes	Applied Economics, Chapter 24, p. 329.
IX. Problems of Small Businesses	IX. A. General Record Keeping, Unit 67, pp. 300-302.
A. Balance Sheet	Mathematics in Business, Chapter 13, pp. 336-342.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

VIII. Secure kits from Federal Internal Revenue Service. Use of actual forms for both federal and state are helpful.

VIII.B. Discuss taxes assessed at the manufacturing level and import taxes.

CONTENT	REFERENCES AND RESOURCES
B. Income Statement	IX. B. General Record Keeping, Unit 100, pp. 410-411. Mathematics in Business, Chapter 13, pp. 342-345.
C. Figuring Payrolls	IX. C. General Record Keeping, Chapter 12, 13, 14, pp. 147-189. Mathematics in Business, Chapter 11, pp. 267-306. General Office Practice, Chapter 34, pp. 455-467. General Mathematics, Chapter 3, pp. 99-129. Arithmetic for Business and Consumer Use, Units 119, 120, 121, pp. 447-458.
D. Purchasing Merchandise	IX. D. General Office Practice, Chapter 33, pp. 442-454. General Record Keeping, Chapter 17, pp.236-257.
E. Discounts	IX. E. General Mathematics, Book 23, Chapter 11, pp. 569-577. Mathematics in Business, Chapter 8, pp. 175-178.
1. Trade	E. 1. Arithmetic for Business and Consumer Use, Unit 43, pp. 175-178.
2. Cash	E. 2. Arithmetic for Business and Consumer Use, Unit 48, pp. 189-192.
3. Rates	
F. Sales Records	
G. Profit on Sales	
1. Gross and Net	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

CONTENT	REFERENCES AND RESOURCES
2. Rate of Markup	IX. G. 2. Arithmetic for Business and Consumer Use, Unit 126, 127, 128, 129, pp. 476-484. Mathematics in Business, Chapter 9, pp. 214-237. Retail Merchandising, Chapter 10, pp. 286-312. Business Principles, Organization, and Management, Chapter 8, pp. 118-122. Retailing Principles and Practices, Chapter 18, pp. 431-447.
H. Sales Invoice	
I. Distribution of Net Income	IX. 1. Business Principles, Organization and Management, Chapter 2, pp. 12-42.
1. Sole Proprietorship	
2. Partnership	
3. Corporation	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

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FILMS:

U. S. Government Films available through the Department of Health, Education, and Welfare:

"Measurement and Leveling," Filmstrip, #1049
"Measuring - Home Management," 35 mm, color
"Mathematics - Unending Search for Excellence," 28 min., 16 mm
"Mathematics Through Discovery," 25 min. 16 mm

McGraw-Hill Secondary School Mathematics Filmstrips, Sets #1, #2, #3

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Educators Progress Service, Educators Guide to Free Films, 24th Annual Edition, 1964, EPS Publication (exceptional films for use with business and consumer programs).

INDUSTRIAL ARTS

UNIT I

Fundamental Operations with Rational Numbers

(4 weeks)

INTRODUCTION: The complexities of modern living require that everyone have an understanding of the fundamental operations with rational numbers.

CONCEPT: The ability to apply the principles and perform the fundamental operations with rational numbers help students become good craftsmen.

CONTENT

I. Whole Numbers (Integers)
  A. Addition
  B. Subtraction
  C. Multiplication
  D. Division
  E. Prime Numbers
  F. Factors

II. Fractions (Simple)
  A. Equivalent Fractions and Identities
  B. Addition - Subtraction
    1. Lowest Common Denominator
    2. Lowest Common Multiple
  C. Multiplication - Division

III. Mixed Numbers and Improper Fractions
  A. Converting Mixed Numbers to Improper Fractions and Vice-Versa
  B. Basic Operations

IV. Decimals
  A. Reading and Writing Decimals
  B. Rounding Off (Approximate Decimals)

REFERENCES AND RESOURCES

I. Basic Mathematics Simplified, Unit I, pp. 2-27.

General Trade Mathematics, 2nd Ed.

"Home Section" Salt Lake Tribune

I.E. Euclid's Elements, Book IX, Prop. 20

The Sieve of Erathosthenes

The Crescent Dictionary of Mathematics, p. 242.

Foundations of Mathematics, p. 74.

The Crescent Dictionary of Mathematics, p. 28.

College Arithmetic, p. 14.

Arithmetic for Colleges, p. 34, 3rd Edition.

Basic Mathematics Simplified, p. 3.

II. Basic Mathematics for Electronics, Chapter 4, pp. 25-34.

General Trade Mathematics, 2nd Ed. Chapter 2, pp. 25-50.

Basic Mathematics Simplified, Sect. 11, pp. 23-47.

The following films are available from the National Council of Teachers of Mathematics:

"Addition and Subtraction of Rational Numbers", No. 591
"Multiplication of Rational Numbers", No. 591
"Big Numbers", No. 604
"Fractions", No. 605
"Decimal Numbers", No. 595

III. The Mathematics of the Shops, Chapter 2, pp. 23-47.

ACTIVITIES, EXAMPLES AND TEACHING SUGGESTIONS

I. Use bills of materials, house plans, and time cards as practical applications in this unit.

I. Teach casting out 9's, the accountants method, and adding up and down (or checking).

II. Good practical problems may be found in Shop Mathematics, Chapter 1, pp. 1-10.

B.1. The least common denominator is explained in Shop Mathematics, pp. 3-4.

CONTENT	REFERENCES AND RESOURCES
	IV. Basic Mathematics Simplified, Unit 12, pp. 63-88.
	General Trade Mathematics, Chapter 3, pp. 51-85.
	Essentials of Mathematics, Chapter 3, pp. 53-57.
C. Basic Operations	Basic Mathematics for Electronics, Chapter 5, pp. 35-42.
D. Decimal Equivalence	

CONTENT	REFERENCES AND RESOURCES
	IV. Basic Mathematics Simplified, Unit 12, pp. 63-88.
	General Trade Mathematics, Chapter 3, pp. 51-85.
	Essentials of Mathematics, Chapter 3, pp. 53-57.
C. Basic Operations	Basic Mathematics for Electronics, Chapter 5, pp. 35-42.
D. Decimal Equivalence	

UNIT II

MEASUREMENT

(6 weeks)

INTRODUCTION: The ability to measure is the foundation of a civilization. As man improves his accuracy in measuring, the frontiers of civilization expand.

CONCEPT: An understanding of the units of measurement, the instruments of measurement, and the computations involving them increase proficiency in industry.

CONTENT	REFERENCES AND RESOURCES
I. Linear Measure (Number Line) A. Units of Measure (Conversions) B. Formulas 1. Perimeter 2. Circumference	I. Basic Mathematics Simplified, Sect. IV, pp. 89-164. General Trade Mathematics, Chapter 9, pp. 188-230. The Mathematics of the Shop, Chapter 1 pp. 1-22. Trouble Shooting Mathematical Skills, Chapter 10, pp. 169-213.
II. Measuring Devices A. Steel Rule B. Steel Square C. Vernier Caliper D. Micrometer	II. Shop Mathematics, Chapter 6, pp. 63-74. Mathematics for Technical and Vocational Schools, Chapter 11, pp. 231-243. The Mathematics of the Shops, Chapter 3, pp. 48-86. General Trade Mathematics, Chapter 12, pp. 305-327.
III. Square Measure (Areas) A. Units of Measure (Conversions) B. Volume (Formulas)	
IV. Cubic Measure A. Units of Measure (Conversions) B Volumes (Formulas)	
V. Liquid Measure A. Units of Measure B. Applications C. Conversions	V. College Arithmetic, Chapter 5, pp. 71-78. Any good physics book.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

Make or secure enlarged models of measuring devices.

Each student should have access to the suggested measuring devices and an assignment should be given requiring him to measure familiar objects.

Check on availability of special calculators, such as cement calculators. Portland Cement Company is a good source.

III. Nero's formula - Let a, b, and c be the sides of any triangle, and let $s = \frac{a+b+c}{2}$, then the area of a triangle $= \sqrt{s\ (s-a)\ (s-b)\ (s-c)}$

2

CONTENT	REFERENCES AND RESOURCES
VI. Special Measures A. Thickness Gauge 1. United States Standard (Ferrous Metals) 2. American (Brown and Sharp) (Non-ferrous Metals)	V. A. General Metals, Frier, McGraw-Hill, p. 49.
B. Sizes 1. Penny Weight (Nails) 2. Numbers (Screws)	V. B. Charts available from Strevell Patterson, Salt Lake Hardware, United States Steel.
VII. Angular Measure A. Units of Measure -(Conversions) B. Measuring Devices	VII. College Arithmetic, Chapter 5, pp. 79-82. General Trade Mathematics, pp. 322-327. Basic Mathematics Simplified, pp. 148-164.
VIII. Metric System A. Units B. Conversions 1. Linear Measure 2. Square Measure 3. Volume Measure 4. Liquid Measure	VIII. Metric System charts available from Superintendent of Documents, U. S. Gov. Printing Office, Washington, D.C. The following films are available from Brigham Young University. "Measurement of Distances and Angles" (see page 257, Mountain - Plains Film Library Association Film Catalog, 1964-65, Encyclopedia Britannica Film)

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

V. A. Teach that:

1. Ferrous metals are those containing iron.

V. A. Teach that

2. Non-ferrous metals are those without iron such as copper, brass, and aluminum.

UNIT III

ALGEBRA

(6 weeks)

INTRODUCTION: In order for students to utilize the formulas used in industry, they must have a basic understanding of algebra.

CONCEPT: Algebra is a means of generalizing and simplifying mathematical ideas and operations.

CONTENT	REFERENCES AND RESOURCES
I. Signed Numbers	I. Use any good algebra book.
A. Number Line	
B. Fundamental Operations with Signed Numbers	
II. Basic Principles	
A. Commutative Principles	
B. Associative Principles	
C. Distributive Principles	
III. Grouping Symbols (Order of Operation)	III. Foundations of Mathematics, Wiebe. Basic Ideas of Algebra, Aiken.
IV. Algebraic Symbols	
A. Symbols of Operation	
B. Symbols of Relationship	
C. Combining Terms	
1. Fundamental Operations	
2. Distributive Principles	
V. Open Sentences (Equations)	
A. Solving Equations	
1. Addition Axiom	
2. Subtraction Axiom	
3. Multiplication Axiom	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. A. Use the number line as a means of showing additon and subtraction of signed numbers.

IV. C. Teach the meaning of like and unlike terms. (This concept is important.)

V. Make sure that students have a firm understanding of the fundamental axioms.

In fractional equations stress the importance of eliminating fractions by multiplying through by the least common denominator.

CONTENT	REFERENCES AND RESOURCES
4. Division Axiom	
B. Solving Story Problems	
VI. Ratio and Proportion	VI. Basic Mathematics Simplified, Sect. 10, pp. 279-292. General Trade Mathematics, Chapter 8, pp. 176-187. Shop Mathematics, pp. 118-120.
A. Direction	
B. Inverse	
VII. Exponents	VII. Basic Mathematics Simplified, pp. 292-304.
A. Concept	
B. Multiplication	
C. Division	
D. Scientific Notation	
VIII. Slide Rule	VIII. Most slide rules come with a good instruction manual. Most libraries have ample resource material available.

VI. Consult good geometry books for general theorems on ratio.

VII. Teach fundamental laws of exponents.

$$X^1 = X$$
$$X^0 = 1$$
$$X^a \cdot X^b = X^{a+b}$$
$$(X^a)^b = X^{ab}$$
$$X^a \div X^b = X^{a-b}$$
$$X^{\frac{a}{b}} = \sqrt[b]{X^a} \text{ where } b \neq 0$$

VIII. The teaching of logarithms is optional. It is suggested that the following slide rule scales be taught: A, K, C, D, S, AND T.

UNIT IV

FINANCES

(12 weeks)

INTRODUCTION: In our modern society the ability to manage finances determines to a large degree the difference between success and failure. A knowledge of financial transactions is a necessity in all facets of daily living.

CONCEPT: An understanding of the use and management of money is essential for financial independence.

CONTENT	REFERENCES AND RESOURCES
I. Per Cent (P = SR)	I. *Basic Mathematics Simplified*, pp. 165-181.
II. Interest	II. *Trouble Shooting Mathematics Skills*, pp. 214-233. *Applied Business Mathematics*, pp. 124-133.
A. Discount	
B. Add On	
C. Simple	
III. Borrowing Money	III. *Applied Business Mathematics*, Unit 6, pp. 165-208.
A. Personal Use	
B. Business Use	
IV. Loan Costs	Source people are available through the Banker's Assocation, Realtor Board, and other professional groups.
A. Real Estate	
1. Abstract of Title	
2. Realtor Fees	
3. Closing Costs	
4. Recording Fees	
B. Personal and Business Loans	
V. Operating a Small Business	V. *Applied Business Mathematics*.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. Use ratio and proportion in teaching per cent.

II. Applied Business Mathematics Workbook is excellent for practical applications.

III. Discuss borrowing money including installment buying and different types of mortgages.

CONTENT	REFERENCES AND RESOURCES
B. Insurance	
1. Casuality	
2. Liability	
3. Theft	
4. Workman's Compensation	
C. Taxes	C. *Applied Business Mathematics*, pp. 313-334.
1. License	
2. Sales	
3. Income	
4. Property	
5. Unemployment Security Tax	
6. F.I.C.A.	
a. Self-employment	
b. Employer	
c. Employee	
D. Variable Costs	D. 1. *Applied Business Mathematics*, pp. 136-164 and 95-115.
1. Wages and Commissions	
2. Materials	
3. Advertising	
4. Operating Expenses	
E. Trade Discounts	E. *Applied Business Mathematics*, pp. 363-377.
VI. Insurance	VI. *Applied Business Mathematics*, pp. 219-221.
A. Life	
1. Term	
2. Renewable Term	
3. Ordinary Life	
4. Limited Pay Life	
5. Endowment	
6. Business and Insurance	

V. C. Perhaps a member of the county assessor's office would discuss aspects of mill levy and tax rates.

V. C. 3. Secure forms for Income Tax (in kit form) from the Internal Revenue Service.

V. D. Point out that one expense not to be overlooked is organizational expenses. (unions and professional organizations)

V. E. Incorporate a discussion of invoices.

VI. A. Obtain a booklet explaining Life Insurance from the Life Insurance Institute.

CONTENT	REFERENCES AND RESOURCES
7. Partnership	
8. Health and Accident	
B. Automobile Insurance	
1. Bodily Injury and Property Damage	
2. Collision	
3. Comprehensive	
4. Medical	
C. Home Insurance	
1. Fire	
2. Casuality	
3. Liability	
4. Comprehensive	
VII. Money Management	
A. Checking Account	
B. Savings Account	B. Applied Business Mathematics, pp. 209-217.
C. Investments	C. Applied Business Mathematics, pp. 223-257.
D. Budgets	D. Applied Business Mathematics, pp. 36-61.
E. Consumer Buying	

VI. B. Secure information about insurance programs from insurance company representatives in your area.

VII. Request assistance from the Bankers Association.

The following topics should be studied under investment:

Stocks, bonds, mutual funds, investment groups, real estate, etc.

UNIT V

GEOMETRY

(6 weeks)

INTRODUCTION: Geometry in industry consists of points, lines, planes, plane and solid figures, and their applications.

CONCEPT: The mastery of geometric ideas makes it possible to describe, design, and construct objects and products of industry.

CONTENT

I. Geometric Figures
   A. Lines
      1. Direction
      2. Types
   B. Angles
      1. Definition
      2. Types
      3. Relationship
   C. Circles
      1. Definition
      2. Parts
      3. Properties
   D. Triangles
      1. Definition
      2. Types
         a. Sides
         b. Angles
            (1) Congruence
            (2) Similar
      3. Properties and Uses
   E. Rectangles
      1. Definition
      2. Uses
      3. Parts

REFERENCES AND RESOURCES

I. Basic Mathematics Simplified, pp. 344-362.
   Any good geometry book.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. As an aid in teaching geometry it is suggested that students close their eyes and try to visualize in their minds the geometric figures being discussed. Whenever possible models and visual aids should also be used.
It is suggested that whenever possible figures be defined in terms of sets of points.

I. D. Emphasize that the triangle is a rigid figure, using pictures of objects such as bridges and houses to show its uses in industry.

I. E. Introduce "Checking for square" by use of 3-4-5 triangle and/or equal diagonals.

CONTENT

- F. Other Common Plane Shapes
    - 1. Parallelograms
    - 2. Trapezoids
    - 3. Regular Polygons
- G. Basic Solids
    - 1. Types
        - a. Prisms
        - b. Rectangular solids
        - c. Cylinders
        - d. Cones
        - e. Pyramids
    - 2. Surface Areas
    - 3. Volumes

II. Geometrical Construction

- A. Constructing Bisectors
    - 1. Line Segments
    - 2. Angles
    - 3. Medians
    - 4. Midlines
- B. Reproducing Geometric Figures
    - 1. Line Segments
    - 2. Angles
    - 3. Triangles
- C. Dividing a Line Segment into N-equal Parts
- D. Perpendiculars
    - 1. Altitudes
    - 2. Projections
- E. Circles
    - 1. Tangents
    - 2. Eccentric
    - 3. Concentric
    - 4. Inscribe
    - 5. Circumscribe

III. Indirect Measurements

- A. Pythagorean Theorem
    - 1. Square Root
    - 2. Radicals

REFERENCES AND RESOURCES

II. Industrial Arts Drafting, pp. 42-64.

Basic Mathematics Simplified, pp. 363-379.

General Trade Mathematics, pp. 283-304.

F. Re-emphasize areas, perimeter, and volumes.

G. Bring in frustrums. Excavations and estimates may also be discussed.

II. All construction should be performed with only a compass and straight edge. When geometric figures are drawn, all drawing tools may be used.

II. A. 4. Teach that midline, as used here, is defined as the line segment which connects the midpoints of two sides of a triangle.

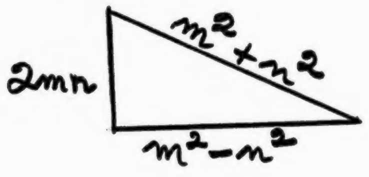
II. C. Review with students three methods of dividing a line segment:

1. Parallel lines - see Industrial Arts Drafting, p. 54.
2. Reproducing angles - see Geometry A Unified Course.
3. Perpendicular - ruler method

II. E. Teach that an eccentric circle is a circle inside of another with a different center.

III. A. Use Pythagorean Theorem to re-emphasize the squaring of rectangles i. e. the 3-4-5 triangles.

As an aid to establish any number of Pythagorean triples, let m and n be any two positive integers such that $m > n$. Then $m^2 - n^2$ and $2mn$ will be the legs of a right triangle and $m^2 + n^2$ will be the hypotenuse.



CONTENT

- B. Trigonometric Relations
  - 1. Ratios
    - a. Sine
    - b. Cosine
    - c. Tangent
  - 2. Use of Tables
  - 3. Special Triangles
    - a. 30 - 60 - 90
    - b. 45 - 45 - 90
- C. Locus
  - 1. Definition
  - 2. Description

IV. Logic (optional)

- A. Syllogism
- B. Implied Conclusions
- C. Deductive and Inductive Reasoning
- D. Venn Diagrams

V. Pattern Making (Optional)

- A. Parallel Line Development
  - 1. Cylinders
    - a. Straight
    - b. Angles (mitres)
  - 2. Rectangles
  - 3. Intersections
- B. Radial Development
- C. Triangulation

REFERENCES AND RESOURCES

B. Any good trigonometry book

V. Sheet Metal

Shop Practice, pp. 174-236.

General Metals, pp. 128-154.

III. B. Establish the difference between congruency and similarity of triangles. Emphasize the proportionality of the corresponding sides of similar triangles leading from here to the trigonometric ratios.

III. C. Describe, but do not attempt to prove at this point.

IV. Introduce students to Aristotle's method of proof. (If-then statements)

UNIT VI

APPLIED INDUSTRIAL MATHEMATICS

(6 weeks)

INTRODUCTION: To improve a student's understanding of the principles of applied consumer mathematics, he most have experience with typical situations which encourage him to apply his knowledge.

CONCEPT: When a student understands and applies the basic principles of industrial mathematics, he has a better chance to succeed in his chosen field.

CONTENT	REFERENCES AND RESOURCES
I. Home Construction	
A. Estimating	
1. Site Selection	
2. Types of Construction	
a. Masonary	
b. Frame	
c. Prefabricated	
3. Plans (Reading)	
4. Financing	
5. Permits and Regulations	
6. Excavating Problems	I. A. 6. House Construction Details, pp. 13-24.
7. Building Materials	
a. Cement	
b. Lumber	
c. Masonary	
8. Utility Connections	
9. Specialists (Sub-contract)	
a. Plumbing	
b. Heating and Air-Conditioning	I. A. 9. b. House Construction Details, pp. 261-282.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. Since home construction or purchase is a universal problem, it is suggested that a typical situation of planning and building a home be used as a practical application.

I. A. 7. All major supply companies will, upon request, supply or furnish information on their materials.

CONTENT	REFERENCES AND RESOURCES
c. Electrical work	
10. Sidewalks, Curbs, Gutters	
11. Landscaping	
12. Roofs and Insulation	
13. Window and Door Schedules	I. A. 13. House Construction Details, pp. 133-167.
14. Painting	I. A. 14. House Construction Details, pp. 283-291.
B. Mathematics Involved in Construction	
1. Layouts	
2. Stress Analysis	I. B. 2. House Construction Details, pp. 61-84.
a. Roof	
b. Spans	
c. Comparative costs	I. B. 2. c. House Construction Details, pp. 292-311.
II. Elective Topics	
A. Machine Shop	
B. Electronics	
C. Sheet Metal	
1. Layout	
2. Materials	
D. Automotive	
1. Gear Ratios	
2. Power Ratings	
3. Engine Performance	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. A. 10. Compare the price of city installation with that of a private contractor.

I. A. 11. Check with a nursery for estimated and/or actual prices.

I. A. 12. Introduce types of insulation.

I. A. 14. Paint companies will provide necessary information.

LIST OF SUGGESTED EQUIPMENT

1. Steel Tape (12' and 50')
2. Carpenter Square
3. Carpenter Level
4. Chalk Box
5. Plumbers Line
6. Transit
7. Micrometers
    a. Inside
    b. Outside
8. Venier Calipers
    a. Inside
    b. Outside
9. T Square and Drawing Board
10. Combination Squares
    a. Center Head
    b. Square Head
    c. Protractor Head
11. Hatchet
12. Plumb Bob
13. Dividers
14. Special Drawing Triangles
15. U.S. Standard American Wire Gauge
16. Conversion Charts
17. Slide Rule Demonstration Model
18. Set of Balance Scales

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GENERAL

UNIT I

FUNDAMENTAL CONCEPTS FOR CONSUMER MATHEMATICS

(4 to 12 weeks)

INTRODUCTION: In order for a teacher to help a student obtain the necessary background for a successful understanding of consumer mathematics, he should utilize the concepts in this unit. It is not intended that all the material be used with every group; however, the extent of its use can be determined by the instructor based on an evaluation of the student's needs.

CONCEPT: An understanding of consumer mathematics is based on a knowledge of fundamental principles of mathematics and arithmetic.

CONTENT	REFERENCES AND RESOURCES
I. Number Bases and Fundamental Operations	I. Modern Mathematics (Book One), Silver-Burdett, p. 33. General Mathematics, (Book Two), p. 102, 12.
A. Addition	
B. Inverse of Addition	B. An abacus can be a very useful visual tool for developing understanding of operations in other number bases.

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. Compare the numbering process of base 10 and another base. This is not meant to be in detail, but only to help the student understand the basic properties.

Students should count in different bases. For example:

Have students count to 25 in base five. Have students count to 25 in base two.

Base 2	Base 10
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8
and so on	and so on

B. Subtraction in Base 7:

5263 seven
4356 seven
604 seven

Regroup the 7's column of the minuend so that it contains 5 sevens. Convert the sixth seven to seven units and add them to the three units in the original problem to obtain 13 seven. Now subtract 6 seven from 13 seven for a result of 4 seven. Subtract 50 seven from 50 seven

CONTENT	REFERENCES AND RESOURCES
C. Multiplication	
1. Prime Numbers	1. *Algebra One - A Modern Course*, Merrill, pp. 251-254.

to obtain 0_{seven}: Regroup 5000_{seven} as 4000_{seven}. Convert the fifth 1000_{seven} to 100's and add them to the two 100's of the original problem. Now subtract 300_{seven} from 1200_{seven} to obtain 600_{seven}.

A specific example of the numbering system in the base 10.

Thousands	Hundreds	Tens	Units	Tenths	Hundredths
3	5	7	6	7	5

$$(3 \cdot 1000) + (5 \cdot 100) + (7 \cdot 10) + (6 \cdot 1) + (7 \cdot 1/10) + (5 \cdot 1/100)$$

C. Have students make addition and multiplication charts using different bases. Example charts using base 4 are as follows:

+	0	1	2	3
0	0	1	2	3
1	1	2	3	10
2	2	3	10	11
3	3	10	11	12

X	0	1	2	3
0	0	0	0	0
1	0	1	2	3
2	0	2	10	12
3	0	3	12	21

1. A prime number is an integer, greater than one, which is divisible only by itself and one. Prime numbers can be illustrated by grouping them into the following categories:

Special Numbers	Prime Numbers	Composite Numbers
	2	4
0 1	3	6
	5	8
	7	9
	11	10
	13	12
	17	14
	19	16
	23	18
	.	20
	.	.
	.	.
		.

Note: Illustrate that a composite number is a product of prime numbers.

CONTENT	REFERENCES AND RESOURCES
2. Composite Numbers	
D. Inverse of Multiplication	
II. Fractions	
A. Proper and Improper	A. Essentials of Mathematics, Person, pp. 21-42.
1. Definition	
2. Lowest Common Multiple	
3. Fundamental Operations	

Discuss with students the idea that:

The Lowest Common Denominator is a product composed of the prime factors of the denominators of the fractions to be added. Each prime factor is used the greatest number of times it appears in any one denominator.

Example:

When adding 1/8, 1/6, and 1/4 the prime factors of the denominators are 2, 2, 2; 2, 3; and 2, 2; respectively. Two appears three times in the first denominator, once in the second, and twice in the third. Thus, the greatest number of times it appears is three. Three appears once in the second denominator, thus, it is used once.

Now, the LCD is the product of $2 \cdot 2 \cdot 2 \cdot 3$, or 24.

3. Adding unlike fractions

The following method may help some students to avoid adding the denominators of unlike fractions:

$$\begin{array}{ll|l} 3/7 & 12 & 28 \\ 1/4 & 7 & \\ \hline & 19/28 & \end{array}$$

LCD is 28

Subtracting fractions

The above mentioned method may also be helpful here.

$$\begin{array}{ll|l} 3/7 & 12 & 28 \\ -1/4 & 7 & \\ \hline & 5/28 & \end{array}$$

LCD is 28

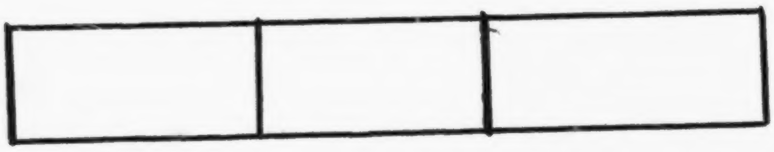
Equivalent fractions

Have students show that 6/8 = 15/20. Use several examples to illustrate equivalent fractions.

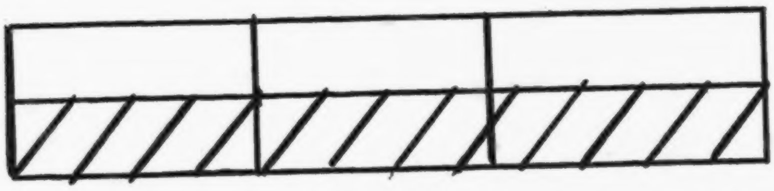
CONTENT	REFERENCES AND RESOURCES
4. Reciprocal	

Example: Multiplication of 1/2 and 3.

Using a rectangular figure divide its area into three equal sections, thus:



Subdivide the figure by drawing a line mid-way between the bases and parallel to them, as follows:



It now appears that 1/2 of three is illustrated. The implication is that $1/2$ of $3 = 1/2 + 1/2 + 1/2 = 3/2$.

4. Reciprocal: Definition - For every number $a \neq 0$, there exists a number $1/a$, such that $a \cdot 1/a = 1$. $1/a$ is called the reciprocal of a, and a is the reciprocal of $1/a$.

Examples: $3 \cdot 1/3 = 1$
$5/7 \cdot 7/5 = 1$

Help students to see that division is defined in terms of multiplication, and that to perform a division a/b is to find a number c, such that $c \cdot b = a$. $(b \neq 0)$

Examples: $\frac{3}{1/4}$ Find c such that $c \cdot 1/4 = 3$

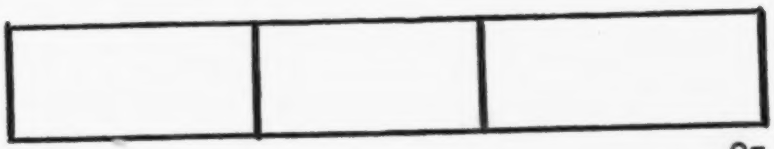
$4/1 \cdot 3 = 12$

$c = 12$

or by reciprocals:

$$\frac{3}{1/4} = \frac{3 \cdot 4/1}{1/4 \cdot 4/1} = 12$$

To solve $\frac{3}{1/4}$ in a pictoral way, one may answer the question, "How many 1/4's are in 3?" Draw a rectangular figure and divide its area into three equal sections, as follows:



CONTENT	REFERENCES AND RESOURCES
5. Ratio and Proportion	
B. Decimals	B. *General Mathematics* (Book Two), Brown, pp. 30-34. *Modern Mathematics - Algebra One*, Silver-Burdett, pp. 258-261.
1. Definition	
2. Relation to Common Fractions	
3. Fundamental Operations	
4. "Rounding Off"	
5. Per Cent	5. *Essentials of Mathematics*, Person, pp. 43-64.
a. Definition	
b. Relationship of fractions and decimals to per cent	
c. Rate, base, and per cent	

Subdivide each of the equal sections into 4 equal parts and then simply count the parts:

5. Introduce proportion by use of equivalent fractions (equivalent ratios).

$2/3 = 4/6 = 6/9 = 8/12 = 10/15 = 12/18 = 14/21 = 16/24 \ldots$

A proportion is two equal ratios.

$2/3 = x/6$
$2 \cdot 6 = 3 \cdot x$
$12 = 3x$

$x = 4$

5. Consider per cent as a ratio.

Example:

$45/100 = .45 = 45\%$

$121/100 = 1.21 = 121\%$

Per cent is the ratio of a number to 100.

Example:

$36/100 = 36\%$

The above concept is very important because proportion is later used to develop ideas regarding applications of per cent.

CONTENT

III. Graphs and Statistics

- A. "Comparison" Graphs
- B. "Time Change" Graphs
- C. Cumulative Graphs
- D. Frequency Distribution
- E. Histogram
- F. Median, Mean, Mode
- G. Standard Deviation

IV. Number Relationships

- A. Principle of Closure
  - 1. Addition
  - 2. Multiplication
- B. Commutative Principle
  - 1. Law of Addition $a + b = b + a$
  - 2. Law of Multiplication $ab = ba$
- C. Associative Principle
  - 1. Law of Addition $a + (b + c) = (a + b) + c$
  - 2. Law of Multiplication $a\ (bc) = (ab)\ c$

REFERENCES AND RESOURCES

III. General Mathematics, (Book Two), Brown, pp. 35-59.

Filmstrip
McGraw Hill Secondary School Mathematics, set #1.

IV. Modern Algebra, Dolciani, pp. 70-78.

Filmstrip
McGraw Hill Secondary School Mathematics Series, set #2-3.

IV. Help the student realize that closure involves two considerations. It must be possible to operate on any two elements of a set and the result must always be an element of the set.

Example:

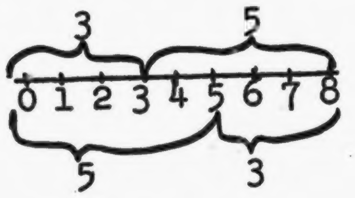
The sum or product of any two whole numbers is a whole number; therefore, the set of whole numbers is closed under the operations of multiplication and addition.

$a + b = c \qquad a \cdot b = c$

$3 + 8 = 11 \qquad 3 \times 8 = 24$

The number line may be used to help students to understand the commutative and associative principles.

B. Example of commutative principle:



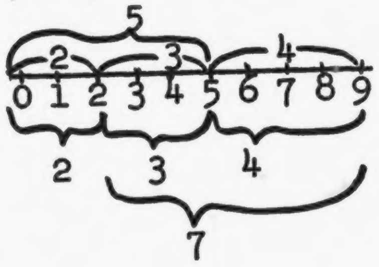
$5+3 = 3+5$

C. Example of associative principles:

$(2 + 3) + 4 = 2 + (3 + 4)$

$5 + 4 = 2 + 7$

$9 = 9$



CONTENT	REFERENCES AND RESOURCES
D. Distributive Principle	
$a\ (b+c)=ab+ac$	
E. Additive Identity	
$a+0=a$	
F. Multiplicative Identity	
$a \cdot 1=a$	
G. Additive Inverse	
$a+(-a)=0$	
H. Multiplicative Inverse	
$a \cdot 1/a=1 \quad a\neq 0$	
V. Algebraic Concepts	V. Modern Elementary Algebra, Nichols.
A. Algebraic Numerals	Modern Algebra, (Book One), Dolciani.
B. Directed Numbers	
1. Number Scale	
2. Absolute Value (Optional)	
C. Algebraic Sentences	
1. Definition	
2. Identities and Conditional Equations	
3. Use of Formulas	
4. Word Problems	
5. Inequalities (Optional)	
D. Powers and Roots	
1. Definitions	
2. Exponents	
3. Radicals	
4. Irrational Numbers	

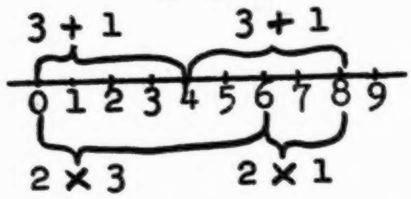
ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

D. Example of distributive principle:

$$2(3+1) = 2 \cdot 3 + 2 \cdot 1$$

$$2(4) = 6 + 2$$

$$8 = 8$$



C. Open sentences may be related to incomplete statements as follows:

$x + 3 = 10$ may be written as, ______ plus three equals ten.

This is similar in form to the incomplete statement;
______ is the capitol of the State of Utah.

Not that either incomplete sentence can be made into a complete and true statement by placing the proper word or number in the blank space. Students should realize that solving an open sentence in algebra is quite similar to completing a sentence in other subjects.

CONTENT	REFERENCES AND RESOURCES
E. Coordinate Graphs 1. Plotting Points in a Plane 2. Graphing of Equations	

UNIT II

FINANCES

(21 weeks)

INTRODUCTION: The essential purpose of this unit is to provide knowledge and skill in the computation of practical financial problems of a personal nature. No attempt has been made to provide an all-inclusive study of the various topics presented. The material in this unit should form a sound basis for subsequent courses in banking, insurance, retailing, and related business subjects. It should also provide background in preparing the student for basic financial situations found in everyday living.

CONCEPT: A student who has a basic understanding of finances is better able to take a productive and active part in school, home, and community.

CONTENT	REFERENCES AND RESOURCES
I. Income	I. Essentials of Business Arithmetic, Chapter 7, pp. 141-148.
A. Vocational Information	A. Business Mathematics, Chapter 7, pp. 138-156.
1. Salaries	
2. Fringe Benefits	
3. Working Conditions	
4. Tenure and Advancement	
B. Wage Deductions	B. Applied Business Mathematics, Unit 4, pp. 101-116.
1. Taxes	
a. Withholding	
b. State income	
2. Social Security	
3. Retirement	
C. Part-Time Employment	C. Arithmetic for Business and Consumer Use, Chapter 10, pp. 224-230.
D. Commissions	D. Applied Business Mathematics, Unit 5, pp. 136-156.
E. Investment Income	

ACTIVITIES, EXAMPLES AND TEACHING SUGGESTIONS

A. Have students estimate salaries for various professional and vocational positions, then verify these salaries from resource materials. Use graphs for comparing salaries.

B. Have several students interview directors of Social Security offices and report the benefits to the class. Illustrate wage deductions by use of graphs.

C. Have students who have part-time jobs indicate salaries and deductions by graphical explanations.

D. Invite a resource person, preferably a salesman, to speak to the class.

CONTENT	REFERENCES AND RESOURCES
II. Budgeting	II. Applied Business Mathematics, Unit 1, pp. 1-2.
A. Personal	
B. Home	
C. School	
D. Business	
E. Charts and Graphs	E. Applied Business Mathematics, Unit II, pp. 347-356. Essentials of Business Arithmetic, Chapter 22, pp. 424-431.
III. Consumer Purchasing	III. Filmstrip "How to Use Consumer Credit", HFC, 919 N. Michigan Ave., Chicago, Illinois. The following agencies are listed as sources of supplementary material: Better Business Bureau Consumer Research Consumer Union Underwriter Laboratories Credit Bureau Professional Organizations Food and Drug Administrations Bureau of Standards
A. Small Items (Cash) 1. Food 2. Clothing 3. Other 4. Unit Price 5. Average Prices 6. Quantity Buying 7. Purchases Involving Mixed Numbers and Percentages	A. Applied Business Mathematics, Unit 2, pp. 44-53.
B. Installment Buying 1. Home (Real Estate) 2. Car	B. Business Mathematics, Chapter 12, pp. 263-282. Applied Business Mathematics, Unit 6, pp. 201-208.

A. Have students prepare a personal budget for themselves for at least one month.

B. Have students prepare a family budget for three basic salaries; show the per cent of salary which would be allocated for shelter, food, clothing, utilities, and other items. (This can be done graphically using a circle or rectangular graph.) Show how budgets will vary according to size of family and needs.

III. Debate the issue: Sales people should present all the facts but should make no attempt to "high pressure" the customer.

A. Analyze the use of labels. Discuss important information given on the labels and the protection given the customer by the label.

Have students collect labels from canned good, packaged good, drugs, and household items. Compare the products as to quantity, quality, and cost.

B. Discuss home ownership vs. renting.

CONTENT	REFERENCES AND RESOURCES
3. Home Furnishings	
4. Business, Industrial, Farm	
C. Cash Buying	C. Business Mathematics, Chapter 8, pp. 176-179.
1. Seasonal	
2. Quality	
3. Quality vs. Quantity	
D. Discount	
E. Premium Buying	
F. Credit Card Buying	
G. Budgeting Bills	
H. Small Business Budgeting	
IV. Interest	IV. Business Mathematics, Chapter 10, pp. 106-114.

B. Have students interview a car salesman. Discuss the difference of financing a car through a bank, a finance company, or a credit union.

Compare difference of buying home furnishings on time, with cash, on discount, and during a sale. Each student should visit a business, industry, or farm implement company to compare differences of cash and installment buying.

C. Make a comparison of small quantity vs. large quantity buying.

Have each student use Consumer's Report or Consumer's Bulletin to help choose an item that he would like to buy.

F. Have students find out procedure for obtaining a credit card.

IV. Have students find variable interest rates from the many sources where money may be borrowed. Make sure they understand the difference in charges under these listed methods for the same principle borrowed:

- a. Interest paid on full amount for entire period borrowed.
- b. Interest paid on remaining balance only.
- c. Interest figured on the simple interest formula.

Explain "time differential" interest by using an actual purchase contract.

Have students compare the interest rates of a company which finances their contract with one which sells their contracts to a finance company.

Have students contrast home ownership from the following three ways of financing:

- a. F.H.A.
- b. G.I.
- c. Bank or Conventional Loans

CONTENT	REFERENCES AND RESOURCES
A. Formula (1 = PRT)	
B. Graphs and Tables	B. Arithmetic for Business and Consumer Use, Chapter 14, pp. 321-330.
C. Simple	
D. Compound	D. Business Arithmetic, Chapter 18, pp. 353-368.
E. Depreciating	
F. Discount	
V. Insurance	V. Arithmetic for Business and Consumer Use, Chapter 16, pp. 364-390.
A. Life Insurance	A. Filmstrip "Life Insurance-What it Means and How it Works", Inst. of Life Insurance, 488 Madison Ave., New York 22, New York. Business Mathematics, Chapter 13, pp. 304-307.
1. Term	
2. Straight Whole Life	
3. Pay Life	
4. Annuity	
a. Retirement	
b. Special type	
c. Sheltered	
5. Mortgage	
a. Home	
b. Car	
c. Special type	
B. Health and Accident	
1. Hospital	
2. Surgery	
3. Special Disease	
4. Special Accident	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

IV. A. Teach the following relationships and show how the last three follow from the first:

$$I = PRT, \quad P = \frac{I}{RT}, \quad R = \frac{I}{PT}, \quad T = \frac{I}{PR}$$

IV. B. & C. Use charts and graphs to show the interest (compound and simple) rates as they increase in time and value.

V. If possible, invite qualified speakers to discuss the following topics with the class:

Life Insurance
Property Insurance
Auto Insurance (Liability and Collision)
Fire Insurance
Rates

Prepare a bulletin board display describing different kinds of insurance.

B. Have students check into school insurance (athletic, bus, and other types) to find out what it covers, and the extent of the premiums.

CONTENT	REFERENCES AND RESOURCES
5. Accidental Death	
6. Full Coverage	
7. Job Security	
C. Property	C. Essentials of Business Arithmetic, Chapter 12, pp. 224-337.
1. Real	
2. Personal	
3. Business	
4. Civic or Church	
D. Liability	
1. Car	1. Business Mathematics, Chapter 13, pp. 296-303. Arithmetic for Business and Consumer Use, Chapter 16, pp. 373-397.
2. Home	
3. Business	
4. Personal	
E. Unemployment	
1. Special Insurance	
2. Planned Savings	
F. Social Security	F. Business Mathematics, Chapter 15, pp. 345-360.
1. Death Benefits	
2. Living Benefit	
G. Retirement	
VI. Banking, Savings, and Loans	
A. Types of Banks	1. General Mathematics, (Book 2), Chapter 11, pp. 536-593.
1. Industrial	A. Arithmetic for Business and Consumer Use, Chapter 15, pp. 333-336.
2. Savings	
3. Loan	
4. Investment	

C. Have students investigate insurance rates and compare homes and businesses in different areas with respect to risk and protection from fire.

VI. Secure one or both of the following films from any bank in your area:

1. "Banking in General Today"
2. "The Banking Industry"

Invite a bank employee to speak to the class on proper procedures in banking.

CONTENT	REFERENCES AND RESOURCES
B. Functions	B. *Applied Business Mathematics*, Unit 1, pp. 1-17.
1. Checking Accounts	
2. Savings Accounts	
3. Safety Deposits	
4. Borrowing	4. *Applied Business Mathematics*, Unit 6, pp. 165-200.
a. Bank loans	
b. Credit loans	
VII. Investments	VII. *Business Mathematics*, Chapter 16, pp. 364-398.
A. Securities	
B. Tax Sheltered Annuities	
C. Stocks and Bonds	C. *Applied Business Mathematics*, Chapter 7, pp. 223-248.
D. Mutual Investments	
E. Property Ownership	
F. Chattel Mortgage	
G. Savings Investment	
H. Taxes on Investment	
VIII. Taxes	VIII. *Business Mathematics*, Chapter 14, pp. 315-359.
A. Income	
1. Federal	
2. State	
B. Property Tax	B.. Filmstrip "The Inevitable Day", Internal Revenue Service, District Director, S. L. C., Utah.

B. Obtain blank samples of checks, deposit slips, and reconciliation statements for actual practice in the classroom.

Discuss correct check writing, such as: clear appearance, proper form, check and stub coordination, and so on.

VII. Let each student assume he has $1,000 to be invested. Let each select at least one common stock and one preferred stock listed in the newspaper. Make a graph of daily closing prices and volume of sales for their chosen stocks. Prepare a profit and loss statement.

Investigate the Junior Achievement Organization.

Discuss the risk in investments due to lack of integrity and dishonest business practices. Newspapers are good sources of information.

C. Invite a broker to speak to the class on investments.

Compare common and preferred stock with respect to returns, rates, and other details from the Wall Street Journal.

Obtain a film to help explain the transactions of Wall Street and the Stock Exchange. (Check with a broker for the best up-to-date film).

E. Have a student give an oral report on Real Estate Investment.

G. Plan a panel discussion on the topic of "Advantages and disadvantages of saving as compared to other investments."

Compare the interest paid by different banks. Have students discuss factors determining the safety of investments.

VIII. Obtain tax kits from the Internal Revenue Service.

Invite an IRS man to speak to the class on tax structure.

Develop a bulletin board, using cartoons, on taxation. Use graphs to illustrate the distribution of tax dollars.

1. Have students prepare a tax return (Form 1040) for a specific set of data.

B. If possible, have students obtain a copy of a city and county budget. Also, have a student interview the County Assessor on property tax framework and report to the rest of the class.

CONTENT	REFERENCES AND RESOURCES
1. Real	
2. Personal	
3. State and Local	
C. Sales Tax	C. Applied Business Mathematics, Unit 10, pp. 318-321.
1. State	
2. City	
D. Excise Tax	
E. Other Taxes	
1. Import-Export	
2. Gift	
3. Inheritance	
4. Auto	
5. Transfer	
6. Toll and Road Taxes	

C. Have students visit a local business and discuss administration of the sales tax with the proprietor.

E. Encourage some students to talk to a lawyer about inheritance tax and other such taxes and obtain related tax forms for practice in the classroom.

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*Recommended as texts for this unit.

UNIT III

MEASUREMENT

(3 weeks)

INTRODUCTION: The major purpose of this unit on measurement is to improve the pupil's ability to visualize and deal quantitatively with measurable objects in everyday life.

CONCEPT: When the ability to manipulate numbers, instruments, and ideas is developed, a better understanding of measurement and its uses results.

CONTENT	REFERENCES AND RESOURCES
I. Measurement Systems	
A. Metric	
B. English	
II. Measurement	II. Essentials of Business Arithmetic, Chapter 23, pp. 432-445. Arithmetic for Business and Consumer Use, Chapter 22, pp. 490-496. Mathematics, A Liberal Arts Approach, Chapter 9, pp. 291-321.
A. Instruments	
1. Rulers and Tapes	
2. Maps and Scale Drawings	
3. Compasses	
4. Protractors	
B. Length	
C. Area	
D. Volume	
E. Dry	
F. Liquid	
III. Weight	III. Arithmetic for Business and Consumer Use, Chapter 22, pp. 485-490.
A. Instruments	
1. Balance Scales	
2. Spring Scales	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. Have a chart available comparing the Metric and English systems. Compare the advantages and disadvantages of each system. Have students make measurement conversions from one measurement system to another. Discuss the history of measurement systems. Emphasize how different measures have been developed.

II. III. IV.

Have students study different types of measurement and report to the class on the different areas of their use.

Have students calibrate a ruler from a given unit of measurement and use it to measure different items.

III. A. Obtain both a balance and a spring scale. Weigh a number of items of known weights on both instruments and then compare the results.

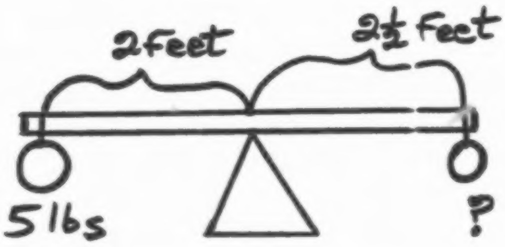
Use a meter stick and find the center of gravity. Place this over a fulcrum. With a set weight at a given distance from the fulcrum; move an unknown weight on the other side until it balances.

CONTENT	REFERENCES AND RESOURCES
IV. Other Measurements	IV. Modern Physics
A. Dial Indicators	Business Mathematics, Chapter 21, pp. 462-472.
1. Electricity	
2. Water	
3. Gas	
B. Speed	
C. Frequency	
D. Production	
E. Consumption	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

The distance times the weight are equal on one side to the distance times the weight on the other side.

EXAMPLE:



$$5 \times 2 = 2\tfrac{1}{2} \times W$$

$$10 = \tfrac{5}{2}W$$

$$\frac{20}{5} = W$$

$$4\text{lbs} = W$$

IV. Have students read the meters at the beginning and at the end of the month for electricity, water, and gas. Discuss the different units of measure used for these utilities.

UNIT IV

INTRODUCTION TO GEOMETRY

(3 weeks)

INTRODUCTION: A knowledge of basic geometric relationships in addition to elementary algebra and arithmetic is essential to many occupations. Students should appreciate geometric figures and the part they play in civilization in the construction of buildings, bridges, machinery, and art. A unit of geometry can strengthen and enrich a student's mathematical background.

CONCEPT: A familiarity with basic geometric relationships produces efficiency in situations where logical reasoning is applicable.

CONTENT	REFERENCES AND RESOURCES
I. Plane Geometric Figures	I. Any good geometry textbook may be used as a reference for this unit.
A. Point	
B. Line	Filmstrip "Lines and Angles" (11 min.) Knowledge Builders, B.Y.U.
C. Plane	
II. Angles	
A. Classification	
B. Measurement	
III. Constructions	
A. Bisections	
1. Line Segments	
2. Angles	

ACTIVITIES, EXAMPLES, AND TEACHING SUGGESTIONS

I. It is suggested that all types of geometric figures be defined as a collection of points.

B. Students should measure several angles to better understand angular measurement and get acquainted with the protractor.

III. All construction should be made only with a straight edge and compass.

Students may be given the opportunity to discover something for themselves by giving only enough instruction to enable them to understand the problem and what they are expected to do. They should then attempt to devise methods of construction on their own and have the opportunity of presenting the different methods discovered to the class.

I. Show how bisecting a line segment may be used for finding the center of a circle or an arc of a circle. Teach the concept of and the process for constructing a circumscribed circle.

CONTENT	REFERENCES AND RESOURCES
B. Perpendiculars	
C. Angles	
D. Parallels	D. Film "Parallel Lines" (10 Min.), Johnson Hunt Productions, B.Y.U.
IV. Polygons	
A. Triangles	
1. Classification	
a. Respect to sides	
b. Respect to angles	
2. Measurement	
a. Perimeter	
b. Area	
3. Right Triangles	
B. Quadrilaterals	B. Film "Geometry and You", (10 Min.), Coronet Production, U. of U. and B.Y.U.
1. Types	
2. Perimeter	
3. Area	

B. Using the techniques of bisecting an angle, teach the process of inscribing a circle within a triangle.

D. Illustrate how the construction of angles and parallel lines may be utilized for dividing a line segment into equal parts.

b. Discuss altitude, median, and angle bisector before introducing area. Use the formula for the area of a rectangle to develop the formula for finding the area of a triangle.

Emphasize the fact that figures with equal perimeters are not necessarily equal in area.

3. Discuss the Theorem of Pythagoras and illustrate its application. Point out that the legs of a right triangle are also its altitudes.

3. Distribute mimeographed copies of an outline of a lake on graph paper to the students. Have them estimate the largest number of fish that the lake will support, given that it has vegetation adequate to feed a certain number of fish per square unit. The unit of measure may be feet, yards, or whatever seems appropriate. (A suggested scale for the lake may be one mile per four units on the graph paper.)

CONTENT	REFERENCES AND RESOURCES
C. Polygons, Other	
1. Pentagon	
2. Hexagon	
3. Octagon	
4. Decagon	
5. Dodecagon	
V. Circles	V. Film "Meaning of Pi," (10 min.), Coronet Production, B.Y.U. and U. of U.
A. Circumferences	
B. Areas	
VI. Geometric Solids	
A. Types	
B. Area	
1. Lateral	
2. Surface	
C. Volume	

IV. C. Have students determine the area of several polygons dividing them into triangles.

V. Students may be assigned the following project: Make several circles on light cardboard. Cut along each circle and roll them along a straight line in order to measure their circumferences. Measure the length of the diameter of each circular region. Then divide the length of each circumference by the length of the diameter of that circle. Students should obtain answers of approximately 3.14059. The results will not be equal, but near enough to convince the student that the value of the ratio $\frac{c}{d}$ is constant; that is Pi.

B. Show that the formula for finding the area of a circle relates to finding the area of an inscribed polygon. That is, the area of an inscribed polygon equals the product of the perimeter and the apothem. As the sides are increased, the perimeter approaches the circumference and the apothem approaches the radius of the circle; therefore, the area of a circle is determined by finding the product of the circumference and radius.

Have students determine the area of a circle first by using the formula and second by drawing the circle accurately on graph paper. Compare results.

VI. Demonstration models are helpful when introducing solids.

B. 1. Illustrate how the method for finding the area of a rectangle is related to finding the lateral area of a cylinder.

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